

Landscape Dynamics and Terrestrial Vegetation

Protocol: Insect Outbreaks

Parks Where Protocol Will Be Implemented: KATM, KEFJ, LACL

Justification/Issues Being Addressed: Disturbance is an important force regulating landscape pattern and process in SWAN (Bennett et al. 2004). High-latitude forests have experienced widespread mortality and/or loss of canopy cover due to insect and disease outbreaks in the past. Resultant changes in stand structure and composition have the potential to substantially impact primary productivity (Mattson and Addy 1975), fuel loads and fire regimes (Schulz 2003, McCullough et al. 1998), wildlife habitat and foraging patterns, biogeochemical cycling, and water quality (Swank et al. 1981). Spruce bark beetles (*Dendroctonus rufipennis* Kirby) and a variety of native and nonnative defoliators (e.g., birch leaf roller, *Epinotia solandriana*; amber-marked birch leaf miner, *Profensa thomsoni*; and willow-defoliating noctuid, *Sunira verberata*) occur at various levels within SWAN parks. An unidentified alder canker (*Cytospora* group) has recently caused widespread mortality of thin-leaf alder in south-central Alaska, and recent defoliation of birch, alder, and willow by a noctuid moth has occurred on approximately 6,920 ac (2,800 ha) in KATM (Wittwer 2005). Changing land use patterns and climatic variation may affect future population dynamics of insects and forest pathogens in the region (Dale et al. 2001), potentially altering forest structure and successional pathways. The current spruce bark beetle outbreak has killed 1.98-2.97 million ac (0.8-1.2 million ha) of forest on the western Kenai Peninsula (Berg 1998) and approximately 86,500 ac (35,000 ha) on the west side of Cook Inlet (Wittwer 2005). Tree-ring reconstructions indicate that most areas of the Kenai experienced regional episodes of thinning during the last two centuries, and work completed in LACL in 2005 is expected to provide a context for the current bark beetle infestation in southwest Alaska.

Specific Monitoring Questions and Objectives to be Addressed by the Protocol:

Questions:

- What species of forest insects and/or pathogens are present in SWAN, and which forest communities are they affecting?
- Are outbreaks of forest insects and/or pathogens localized or widespread in SWAN parks?
- Is tree mortality due to insect or disease outbreaks increasing (i.e., is the rate of mortality increasing)?

Objectives:

- Detect the establishment of new native and nonnative insects and pathogens in SWAN parks, as identified by U.S. Forest Service (USFS) and Alaska Department of Natural Resources (ADNR) inventories.
- Use ADNR/USFS inventory data to monitor extent and rate of expansion of insect and disease outbreaks in SWAN parks over 1-, 5-, and 10-yr intervals.
- Identify areas in SWAN that have experienced the greatest insect-related mortality (e.g., post-stratify by elevation class and/or landform).

Basic Approach: Broad-scale mapping of insect and disease outbreaks can be used to monitor biotic disturbance in SWAN parks. The USFS, Alaska Region, and ADNR, Division of Forestry, conduct aerial detection mapping annually to document the extent of forest insect damage throughout large areas of the state. Aerial sketch maps (1:250,000) are converted to polygon-based geographic information system map products (<http://agdc.usgs.gov/data/projects/fhm/>) that are distributed with the Forest Health Condition Report. The ADNR/USFS data are available from 1989 to present and may be used in conjunction with multispectral satellite imagery (e.g., Landsat TM or equivalent) to quantify changes in the distribution and extent of forest mortality (see Land Cover and Land Use Change protocol). Areas of specific interest in SWAN parks may be mapped and/or visited by ADNR/USFS, upon request.

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Development Schedule, Budget, and Expected Interim Products:

This is an existing monitoring program through ADNR and USFS with no cost to NPS for development or implementation of the sampling protocol. A protocol to acquire annual ADNR/USFS forest survey data will be developed in FY 2006.

2006 Develop protocol for data acquisition.

2007 Test protocol.

2008 Implement protocol.

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